

IEPA PERMIT WRITER'S PHOSPHORUS CHECKLIST

Facility Name: Springfield Metro Sanitary Dist. Sugar Creek Plant
Facility Permit Number: IL0021971

	YES	NO
1. Does the facility discharge upstream from or directly to a water body segment on the State of Illinois CWA § 303(d) list for either dissolved oxygen or unnatural growth of plants or algae?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. If the facility discharges upstream of or directly to a water body segment with an approved TMDL for phosphorus, does the permit have: a. A numeric effluent limit for total phosphorus that is consistent with the assumptions and requirements of the WLA in the TMDL, or b. Conditions that are consistent with the conclusions or findings of the TMDL?	<input type="checkbox"/> <input type="checkbox"/>	NA <input type="checkbox"/> <input type="checkbox"/>
3. If the facility discharges upstream of or directly to a water body segment on the State of Illinois CWA § 303(d) list for either dissolved oxygen or unnatural growth of plants or algae, but a TMDL is not yet approved, does the permit have any of the following: a. A numeric effluent limit for total phosphorus of 1 mg/L or less; b. Limitations or conditions consistent with an alternative water quality study, or c. Conditions with appropriate monitoring and modeling for development of a numeric effluent limit	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	NA <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4. If the facility discharges directly to or within 25 miles upstream from a lake or reservoir that is 20 acres or more in size, does the permit have a numeric effluent limit for total phosphorus of 1 mg/L or less?	<input type="checkbox"/>	<input type="checkbox"/> NA
5. If the facility is new or expanded as provided in 35 Ill. Adm. Code 304.123 g)3), does it have a design average flow of 1.0 MGD or more receiving primarily domestic wastewater or, for other than primarily domestic wastewater, does the facility have a phosphorus load of 25 lbs/day or more?	<input checked="" type="checkbox"/> (proceed to question 6)	<input type="checkbox"/>
6. If yes to question 5, does the permit have a numeric limit for Total P of 1 mg/L or less?	<input checked="" type="checkbox"/> (Proposed expansion only)	<input type="checkbox"/>

Please provide completed checklists to EPA Region 5, NPDES Programs Branch, Chief of Section 1 not less than 30 days before the anticipated public notice date of permits for all major dischargers. On review of a given checklist, EPA may elect to review the permit under 40 C.F.R. § 123.44.

Municipal NPDES Review Sheet

Name of Facility Springfield Metro SD-Sugar Creek IL00 21971
 Renewal 20 New Modification

Description of Sewage Treatment Plant and Sewer System:

Separate Sewer <u> </u>	# of Discharges <u> </u>
Design Ave. Flow <u>10</u> MGD	Combined Sewer <u>✓</u>
Design Max Flow <u>25</u> MGD	# of CSO's <u>2</u>
Actual Ave. Flow <u>8.8</u> MGD	CSO Treatment Yes <u> </u> No <u> </u>

Classification of Discharge and Stream Use:

Name of Receiving Stream <u>Sugar Creek</u>	
Upstream 7Q10 Flow <u>1.5</u> CFS or <u> </u> MGD	
Waived Cat. <u> </u>	General Use <u> </u>
Non Waived <u>✓</u>	Secondary Contact <u> </u>
Water Quality Limited <u>✓</u>	Lake Michigan <u> </u>
Effluent Limited <u>✓</u>	Public Food Processing Water Supply <u> </u>
PCB Order <u> </u>	

Permit Conditions and Limitations:

CBOD <u>10</u> mg/l,	TSS <u>12</u> mg/l	Other Parameters <u> </u>
Fecal Coliform Yes <u> </u> No <u>✓</u>		<u>P limit for proposed facility</u>
PH Yes <u>✓</u> No <u> </u>		<u> </u>
Ammonia Yes <u>✓</u> No <u> </u>		<u> </u>
P Yes <u> </u> No <u>✓</u>		<u> </u>
Chlorine Yes <u> </u> No <u>✓</u>		<u> </u>

Miscellaneous:

Toxics Control(biomonitoring)	Yes <u>✓</u> No <u> </u>	6-month <u> </u>
Fecal Exemption <u>1</u> yr <u> </u> snl	Yes <u>✓</u> No <u> </u>	Date <u>5-1-89</u>
De-Chlorination Schedule	Yes <u> </u> No <u>✓</u>	Date <u> </u>
Lagoon Exemption	Yes <u> </u> No <u>✓</u>	
Enforcement Pending	Yes <u> </u> No <u>✓</u>	
Metals Derivation Needed	Yes <u>✓</u> No <u> </u>	
Certified Operator Class <u>1</u>		
CSO Provisions in permit	Yes <u>✓</u> No <u> </u>	
Excess Flow	Yes <u>✓</u> No <u> </u>	
Anti-degradation	Yes <u> </u> No <u>✓</u>	PN Required <u> </u>
Subject to 208 review	Yes <u> </u> No <u>✓</u>	
Sludge Provisions Needed	Yes <u>✓</u> No <u> </u>	
Pretreatment Program	Yes <u>✓</u> No <u> </u>	
Targeted Watershed	Yes <u> </u> No <u>✓</u>	
Mixing Zone Derivation Needed	Yes <u> </u> No <u>✓</u>	
Consent Decree	Yes <u> </u> No <u>✓</u>	

Comments:

Signature: Date

IL 532-1083

WPC 411 rev 8/93

Printed on Recycled Paper

Facility Name Springfield Metro SD - Sugar Creek NPDES Permit No. IL 0021971

Preliminary

- ☒ T Screening
- ☒ M Grit Removal
- ☒ Y Equalization
- ☒ 6A Excess Flow Treatment
- H Grinding (Comminutors)
- 3N Holding or Detention Pond
- 1N Microstraining (Microscreening)
- 3C Anaerobic Treatment

Tertiary

- ☒ 3V Polishing Lagoons
- 1R Rapid Sand Filtration
- 6F Rock Filter
- ☒ U Sedimentation (Settling)
- 1Z Intermittent Sand Filtration
- 3W Recirculating Sand Filter
- 8H Constructed Wetlands
- 3L Post Aeration

Primary

- 3B Aerated Lagoons
- 6B Imhoff Tank
- 1N Microstraining (Microscreening)
- 1U Sedimentation (Settling or Clarifiers)
- 3T Septic Tanks
- 3G Stabilization Ponds
- 3H Trickling (Roughing) Filtration

Disinfection

- 2E Dechlorination
- 2F Disinfection (Chlorine)
- 2H Disinfection (Other)
- 4I Disinfection (Ultraviolet)

Secondary

- ☒ 3A Activated Sludge
- 6L Two Stage Activated Sludge
- 3B Aerated Lagoons
- 3V Facultative Lagoons
- 8E Oxidation Ditch
- 8F Contact Stabilization
- 8G Extended Aeration
- 8I Sequential Batch Reactors
- 3I Rotating Biological Contactors
- 1Z Intermittent Sand Filtration
- 3W Recirculating Sand Filter
- 3G Stabilization Ponds
- 3H Trickling Filtration
- 8H Constructed Wetland

Sludge Treatment

- ☒ 5A Aerobic Digestion
- 5B Anaerobic Digestion
- ☒ 6F Lime Stabilization
- 5C Belt Filtration
- 5D Centrifugation
- 5H Drying Beds
- 5U Vacuum Filtration
- 5J Flotation Thickening
- 5L Gravity Thickening
- 5T Sludge Lagoons
- 5P Land Application (Sludge)
- ☒ 6Q Landfill
- 5O Incineration
- 5X Sludge Transport to Other Treatment Facility

Nutrient Removal

- 2C Chemical Precipitation
- 3D Nitrification/Denitrification
- 6H Phosphorus Removal
- 3I Rotating Biological Contactors
- 3H Trickling Filtration
- 6L Two Stage Activated Sludge

Effluent Disposal

- 3F Spray Irrigation/Land Application
- ☒ 4A Discharge to Surface Water
- 6J Subsurface Seepage
- 4K Diffused Outfall
- 4E Reuse or Sale of Wastewater

03/23/2006

j:\mocket\mpdes\characterization of treatment process.doc

IL 532 2234

WPC 634 Mar-06



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 - (217) 782-3397
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 - (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

Memorandum

Date: 12-2-13
To: Bob Mosher, DWPC Standards
From: Brent Fleming
Subject: Request for Water Quality Standards Evaluation

An NPDES permit will be drafted for the facility identified below. The following standards related items are requested to facilitate permit issuance:

☒ Antidegradation Assessment ☐ new discharge ☒ expanded
☐ relocated ☐ Additional Parameters of Concern _____

Current DAF 10.0 MGD; Proposed DAF 15.0 MGD

- ☐ Reasonable Potential/Water Quality Based Effluent Limits Analysis
(parameters of concern attached or given below)
- ☐ Whole Effluent Biomonitoring Recommendations
- ☐ Ammonia Limits Current Limits (avg/max) Summer _____ mg/L; Winter _____ mg/L
☐ Facility now collects ammonia data 5 days per week
- ☐ 303(d)/BSC Listing or Rating for Receiving Water
- ☐ Dissolved Oxygen Limits

Facility Name: Springfield SD - Sugar Creek

NPDES Permit No. IL00 21971 Receiving Waters Sugar Creek

County Sangamon NPDES Expiration Date: 12-31-2011

☒ Major Facility ☐ Minor Facility DAF/Highest monthly avg. flow _____

☐ Copy of NPDES Permit Application/Map forwarded to IDNR on _____

☐ IDNR Endangered Species action Report included with received application (copy attached)

Comments: _____

Appendix B-2. Specific Assessment Information for Streams, 2014.

Name	Assessment Unit ID	10-Digit HUC	IEPA Basin	Cat.	Size (miles)	Use Attainment	Causes	Sources
Sugar Cr.	IL_ATHG-07	0514020401	32	2	7.46	F582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_ATHG-05	0514020401	32	4A	0.92	F582, X583, N585, X586, X590	400	N/A
Sugar Cr.	IL_OPABA	0714020201	24	3	6.26	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_CHD	0512011406	31	3	11.2	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_EID-04	0713000907	22	2	9.92	F582, X583, X586, X590	N/A	N/A
Sugar Cr.	IL_BM-C2	0512011105	30	5	2.18	N582, X583, X585, X586, X590	319, 322, 371, 462	58, 85
Sugar Cr.	IL_BM-A1	0512011105	30	3	1.11	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_BM-02	0512011105	30	2	14.17	F582, X583, X586, F590	N/A	N/A
Sugar Cr.	IL_BM	0512011105	30	3	4.73	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_EID-07	0713000907	22	5	13.7	N582, X583, X585, X586, X590	322	140
Sugar Cr.	IL_NZP	0714010607	26	3	3.03	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_CG	0512011408	31	2	14.12	F582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_EID-C1	0713000907	22	5	23.91	N582, X583, X585, X586, X590	462, 501	85, 20
Sugar Cr.	IL_EOA-06	0713000707	20	5	3.2	N582, X583, X585, X586, X590	84, 123, 462	132, 144, 62, 85
Sugar Cr.	IL_EID-C8	0713000907	22	2	12.66	F582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_BF-22	0512011114	30	3	9.46	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_BF-01	0512011114	30	5	4.84	N582, X583, N585, X586, X590	138, 322, 403, 462, 400	62, 85, 177, 140
Sugar Cr.	IL_CJB	0512011405	31	3	12.96	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr.	IL_EOA-01	0713000707	20	5	4.04	N582, X583, X586, X590	123	62
Sugar Cr.	IL_AJD-15	0514020308	32	4C	12.12	N582, X583, X585, X586, F590	228	72, 132, 144, 156
Sugar Cr.	IL_EOA-04	0713000707	20	5	34.28	N582, X583, X585, X586, X590	462	85, 144
Sugar Cr.	IL_JQJ	0714010101	27	3	3.25	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr. Central	IL_BI	0512011111	30	3	7.61	X582, X583, X585, X586, X590	N/A	N/A
Sugar Cr. South	IL_BZW	0512011117	30	3	7.29	X582, X583, X585, X586, X590	N/A	N/A
Sugar Fk.	IL_ODLA-01	0714020404	25	5	18.56	N582, X583, X585, X586, X590	273, 322	4, 66, 102, 143, 156
Sugar R.	IL_PWB-03	0709000408	7	5	4.57	F582, N583, X585, X586, X590	348	140
Sugar R.	IL_PWB-01	0709000408	7	5	5.65	F582, N583, X585, X586, X590	348	140
Sugar Run	IL_GF-01	0712000409	2	5	7.32	N582, X583, X585, X586, X590	96, 273, 322, 371, 441	28, 177, 122, 144
Sullivan Branch	IL_NHJ	0714010604	26	3	6.56	X582, X583, X585, X586, X590	N/A	N/A
Sulphur Branch	IL_OJFA	0714020208	24	3	2.69	X582, X583, X585, X586, X590	N/A	N/A
Sumner Cr.	IL_PWH-02	0709000314	7	2	12.97	F582, X583, X585, X586, X590	N/A	N/A
Sunfish Slough	IL_MF	0708010102	9	3	0.98	X582, X583, X585, X586, X590	N/A	N/A
Susan Branch	IL_CHC	0512011406	31	3	2.26	X582, X583, X585, X586, X590	N/A	N/A
Sutphens Run	IL_DTAC	0712000705	4	2	12.98	F582, X583, X585, X586, X590	N/A	N/A
Sutton Cr.	IL_CAzb	0512011502	31	3	7.5	X582, X583, X585, X586, X590	N/A	N/A

Springfield Metro SD – Sugar Creek
NPDES IL0021971
Review Notes – Influent Diversion Structure
1/30/2014

On January 29, 2014 I discussed the influent diversion of flows with Nate Davis of CMT and he confirmed the following:

The Sugar Creek improvements will include an influent diversion structure before grit removal and bar screening. The structure will divert 37.5 mgd (the facilities DMF) to a new headworks building consisting of grit removal and bar screening and then continuing to the primary and secondary treatment. Flows over 37.5 mgd will be diverted to the old headworks building for grit removal and bar screening and then continue to "excess flow" clarifiers and disinfection before discharging from outfall 010 Treated Combined Sewage Outfall. Flows in excess of 112.5 mgd will be discharged through CSO Outfall 011.

Because the diversion of flows between the main plant and CSO facilities takes place before grit removal and bar screening the facility will not be subject to "bypass" rules and therefore not required to do a No Feasible Alternatives Study. Grit removal and bar screening of the main plant flows and treated CSO flows takes place at two entirely different buildings.

I also discussed why the proposal includes UV disinfection equipment. The facility currently has a disinfection exemption which was recently continued in a letter dated July 5, 2011. Nate confirmed that at this time the facility will not be constructing UV disinfection equipment but it was included in the Facility Plan for "planning ahead purposes". If disinfecting is required in the future, the required footprint will be available.

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

IL 532-0357
ADM 39
054-002

Subject SPRINGFIELD METRO SD - Sugar Creek

Data FP-0912 617-2909

Reviewed by Brant Fleming

Date 8/27/12

Description: Expand and upgrade the existing activated
Sludge plant.

Current Conditions

DAF = 10 MGD

DAF = 25 MGD

BOD = 10,200 lbs/day

TSS = 12,000 lbs/day

Proposed Conditions - From Basis of Design

DAF = 15 MGD

DAF = 37.5 MGD

BOD = 17,515 lbs/day

TSS = 18,400 lbs/day

NH₃ = 1,715 lbs/day

P = 350 lbs/day

Influent Screening

2 Coarse screens rated at 18.75 MGD each

2 Fine screens rated at 18.75 MGD each

- each screen to have washing and compacting unit.

- Bypass channel with manual bar screen

Grit Removal

2 vortex-type grit removal tanks 16' in diameter
with a depth of 16' and a treatment capacity
of 37.5 MGD each.

Subject _____

Data _____

Reviewed by _____ Date _____

Influent Pump Station

The influent pump station will be placed downstream of the preliminary treatment to prevent wear due to solids and grit.

- 3 pumps rated at 18.75 mgd at 20' - screw pumps
- total with largest unit out of service = 37.5 MGD

Activated Sludge - Verticell process

- Essentially the same as the VLR process except a line bubble reactor replaces (1) of the VLRs at the end of each train. The line bubble diffuser reactor gives the plant more flexibility.
- Design consists of two (2) trains of four (4) new tanks for a total of eight (8) tanks. Each train consists of one (1) VLA tank as an anaerobic reactor, two (2) VLR tanks will provide simultaneous anoxic/oxic conditions and (1) line bubble tank that is subdivided into oxic, post anoxic and post aerobic zones.

Tank Volumes per train

1 VLR anaerobic reactor
 $190' \times 30' \times 20' = 114,000 \text{ CF}$

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

IL 532-0357
ADM 39
054-002

Subject _____

Data _____

Reviewed by _____

Date _____

2 VLR anoxic/oxic reactors

$$2 \times 190' \times 30' \times 20' = 228,000 \text{ cf}$$

1 fine bubble tank

$$90' \times 60' \times 20' = 108,000 \text{ cf}$$

total volume per train

$$= 114,000 + 228,000 + 108,000 = 450,000 \text{ cf}$$

$$\begin{aligned} \text{total volume} &= 2(450,000) = 900,000 \text{ cf} \\ &= 6,732,000 \text{ gal} \end{aligned}$$

$$\text{lbs/1000 cf} = \frac{17515 \text{ lbs BOD/day} \times 1000}{900,000 \text{ cf}} = 19.5 \text{ lb-BOD/1000 cf}$$

See Appendix A for Design Calculations of
Aerobic Tanks, Anoxic Tank 1 & 2 given site
specific conditions

UV Disinfection

- 2 channels with 8 modules and 36 lamps/module

$$\text{UV Transmittance} = 65\%$$

$$\text{UV End of Lamp Life Factor} = 0.70$$

$$\text{Fouling Factor} = 0.80$$

Consistent with Trojan design parameters

Subject _____

Data _____

Reviewed by _____ Date _____

Per Basis of Design

- Min UV Dose @ Peak Flow = 40,000 $\mu\text{Watt-sec/cm}^2$

using Trojan Design specs

Fouling = 95% - Automatic cleaning

Lamp Factor = 0.8

High output Low Pressure

60 gpm/lamp

- See Appendix A

37,500,000

$\div .95(.8)(24)(60)(60 \text{ gpm/lamp})$

= 571 lamps

Check with manufacture specs when reviewing
Construction permit.

Post Aeration

Provided by Cascade Aerator and fine bubble
aeration tank.

Initial D.O. = 2 mg/L

Final D.O. = 6 mg/L

Cascade aerator

width = 12'

Height = 9'

Aeration Tank

Aeration = 575 SCFM

Subject _____

Data _____

Reviewed by _____ Date _____

Phosphorus Removal - Chemical Addition

$$\text{Influent P} = 2.8 \text{ mg/L}$$

$$\text{load} = 2.8 (8.34) (15) = 350 \text{ lb/day}$$

$$\text{P removal in WAS} = 1.5\%$$

$$\text{WAS load} = 12,874 \text{ lb/day}$$

$$\text{P removal} = .015 \times 12,874 = 193 \text{ lb/d}$$

$$\text{Effluent P} = 0.25 \text{ mg/L}$$

$$\text{load} = 0.25 (8.34) (15) = 93.8 \text{ lb/d}$$

$$\text{P to be removed} = 350 - 193 - 93.8 = 63.2 \text{ lb/d}$$

$$\text{Per Basis of Design Mass of Alum to Mass of P} = 14.39$$

$$\text{Alum loading required} = 63.2 \text{ lb/d} \times 14.39 = 909.4 \text{ lb/d}$$

$$\text{Alum flow rate} = \frac{\text{Alum loading}}{\text{Alum specific weight} \times \text{Alum weight \%}}$$

$$= \frac{909.4}{11.4 \times 47.6\%} = 171.5 \text{ gal/d}$$

Storage of 14 days

$$171.5 \times 14 = 2401 \text{ gal}$$

2400 gal tanks provided

Subject _____

Data _____

Reviewed by _____ Date _____

Secondary Clarifiers

4 units @ 110' diameter

$$\text{Area} = \pi (55)^2 = 9498.5 \text{ ft}^2$$

$$\text{Total} = 37994 \text{ ft}^2$$

$$\text{SSR @ DAF} = \frac{15,000,000}{37994} = 395 \text{ gal/ft}^2$$

$$\text{SSR @ DAF} = \frac{37,500,000}{37994} = 987 \text{ gal/ft}^2 < 1000 \text{ gal/ft}^2 \text{ O.K.}$$

Intermediate Pump Station

- 2 sets of pumps to maintain continuous flow

Low Slow pumps - 2 @ 2.3 mgd each

High Slow pumps - 3 @ 11.0 mgd each

Standby High Slow - 1 @ 11.0 mgd

Total pump capacity with (1) large unit out of service

$$2(2.3 \text{ mgd}) + 3(11.0 \text{ mgd}) = 37.3 \text{ mgd}$$

Subject _____

Data _____

Reviewed by _____ Date _____

Bio Solids Processing - Post Lime Stabilization

Influent Sludge Flow Rate = 107 gpm = 154,000 gpd
Sludge Concentration = 1.0%

Flow equalization basins
2 @ 165' x 30' x 15'
= 148,500 ft³ = 1,110,929 gal

Storage in equalization basin = $\frac{1,110,929}{154,000} = 7.2$ days

Air required = 30 scfm/1000 cfm

$\frac{148,500}{1000} \times 30 = 4,455$ scfm

3 blowers rated @ 2,230 cfm

Dewatering units

3 units @ 321 gpm and 1 standby unit
Influent sludge conc = 1.0%
Effluent sludge rate = 14 gpm
Effluent conc. = 20%

Post lime stabilization

Dewatered cake rate = 16,095 Per Basis of design
given work hrs/day & sludge rate

Dry solids = 3219 lb/hr

Required lime dose = 0.2 lb lime/lb solids

Lime usage = 3219 (0.2) = 643.8 lb lime/hr operation

Subject _____

Data _____

Reviewed by _____ Date _____

Dry Sludge Storage

90 days capacity required

Daily WTS = 12,874 lb/day
specific gravity at 20 % WTS = 1.19

$$\text{Volume of dewatered sludge} = \frac{12,874}{62.4(1.19)(.2)} = 867 \text{ ft}^3/\text{day}$$

Lime usage = 2375 lb/day

Unit weight of lime = 55 lb/ft³

$$\text{Volume of lime} = \frac{2375 \text{ lb/day}}{55 \text{ lb/ft}^3} = 47 \text{ ft}^3/\text{day}$$

$$\text{Volume of processed sludge} = 867 + 47 = 914 \text{ ft}^3/\text{day}$$

$$\text{Volume of 90 days} = 914(90) = 82260 \text{ ft}^3$$

$$\text{Storage} = 1.6 \text{ ft}^3/\text{ft}^2 = 19.2 \text{ in depth}$$

$$\frac{82260 \text{ ft}^3}{1.6 \text{ ft}^3/\text{ft}^2} = 51,413 \text{ ft}^2$$

$$\text{Area provided} = 227 \times 227 = 51529 \text{ ft}^2$$

Aeration calculation were provided and reviewed.

3 blowers rated at 1,150 SCFM each

$$\text{SCFM required} = 2,300 \text{ SCFM}$$

1 blower for standby

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

IL 532-0357
ADM 39
054-002

Subject Springfield Metro - Sugar Creek

Data FP-0912 417-2909

Reviewed by Brian Fleming Date _____

Notes:

Phosphorus will be biologically and chemically removed to meet the NPDES phosphorus limit of 1.0 mg/L

Page 7-2 indicates an anticipated effluent concentration for Total Nitrogen to be 10.0 mg/L. The NPDES Permit should be given a special condition to operate the plant to meet a Total Nitrogen of 10 mg/L.

An Antidegradation Assessment was conducted and resulted in the attainment of water quality standards.

The facility discharges to Sugar Creek (segment EOA-06) which is impaired for aquatic life with causes given as alteration in stream-side or littoral vegetative cover, boron and phosphorus. The 6/12/12 memo indicates the facility is not causing any impairment prohibited by the narrative water quality standard.



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397

PAT QUINN, GOVERNOR

JOHN J. KIM, INTERIM DIRECTOR

Memorandum

Date: 12 June 2012
To: Brant Fleming
From: Scott Twait 55
Subject: Springfield Metro SD – Sugar Creek -- Antidegradation Assessment
 NPDES Permit No. IL0021971 (Sangamon County)

The subject facility is proposing to replace the existing activated sludge facility with design average flow (DAF) of 10.0 MGD with a VertiCel facility with a DAF of 15.0 MGD. The consultant has estimated that the wastewater being treated at the Sugar Creek facility will increase by 50% in the next twenty years. The District has given consideration to ammonia nitrogen and total phosphorus removal.

The facility is proposing to remove phosphorus and denitrify biologically. The NPDES permit will have a permit limit of 1.0 mg/L for phosphorous. Therefore, loading of phosphorus and nitrogen to the receiving stream will be reduced.

The information in this antidegradation assessment came from the January 2012 Wastewater Treatment Facilities Planning Report by Crawford, Murphy & Tilly, Inc.

Identification and Characterization of the Affected Water Body.

The subject facility discharges to Sugar Creek at a point where 1.5 cfs of flow exists upstream of the outfall during critical 7Q10 low-flow conditions. Sugar Creek (segment EOA-06) is a General Use water. Sugar Creek is not listed as a biologically significant stream in the 2008 Illinois Department of Natural Resources Publication *Integrating Multiple Taxa in a Biological Stream Rating System* at this locality, nor is it given an integrity rating in that report. Sugar Creek is listed on the draft 2010 Illinois Integrated Water Quality Report and Section 303(d) List as an impaired water body for aquatic life uses. Potential causes of aquatic life use impairment are given as alterations in stream-side vegetative cover (non-pollutant), boron, and total phosphorus. Sugar Creek is not designated as an enhanced water at this location pursuant to the dissolved oxygen water quality standard.

Identification of Proposed Pollutant Load Increases or Potential Impacts on Uses.

The treated domestic waste that characterizes this proposed effluent would be similar to other treated effluents of largely domestic origin. Ammonia limits in the permit will be set at water quality standards, however; ammonia loading to the receiving stream will increase over existing background levels as the expanded effluent discharge will be allowed an average of 643.6 lbs/day (as a weighted average), up from the currently allowed level of 429.5 lbs/day (as a weighted average). Biochemical oxygen demand (BOD) permit limits will be set at the most stringent effluent standards applicable in 35 IAC 304.120. The stream will nonetheless experience an increase in loading in BOD as the expanded effluent discharge will be allowed an average of 3128 lbs/day, up from the currently allowed level of 2085 lbs/day. A dissolved oxygen model, submitted in the facility plan, was used to determine the impact of the expansion on the receiving stream. The model indicated that the dissolved oxygen difference between the current DAF of 10 MGD and the proposed DAF of 15 MGD will be 0.44 mg/L.

Phosphorus and total nitrogen loading will decrease as a result of the expanded facility removing phosphorus and denitrifying. The Agency is developing state water quality standards that will formulate the basis for future nutrient management strategies. Upon adoption of state standards and development of a management strategy, there may be additional nutrient reduction requirements imposed on this source. The Illinois Nutrient Standards Workgroup has been convened to develop nutrient standards and will strive to keep NPDES permitted dischargers aware of its findings, allowing them to anticipate future nutrient permit limits.

Fate and Effect of Parameters Proposed for Increased Loading.

The BOD and ammonia discharged by this facility will decay into simpler and harmless byproducts by naturally occurring organisms in the receiving stream. Some of the nitrogen originating in the ammonia will remain in the stream in the form of nitrates or organic nitrogen. Ammonia and dissolved oxygen standards will be met in the receiving stream.

Purpose and Social & Economic Benefits of the Proposed Activity.

The proposed project continues to provide treatment capacity for future growth at the centralized treatment facilities that treats wastewater from Springfield, Rochester, Clear Lake Village and CWLP (cooling tower water).

Assessments of Alternatives for Less Increase in Loading or Minimal Environmental Degradation.

The facilities Plan investigated the feasibility of land application of the additional flow (5 MGD). This would require at least 2,169 acres. It was determined to not be feasible to land apply the additional flow.

The facility has proposed constructing a biological system to denitrify and remove total phosphorus.

Summary Comments of the Illinois Department of Natural Resources, Regional Planning Commissions, Zoning Boards or Other Entities.

On June 12, 2012, the IDNR EcoCAT web-based tool was used and indicated that there were no endangered/threatened species present in the vicinity of the discharge. While the IDNR EcoCAT web-based tool did not terminate the consultation because of the nearby presence of wetlands, future termination is likely.

Agency Conclusion.

This preliminary assessment was conducted pursuant to the Illinois Pollution Control Board regulation for Antidegradation found at 35 Ill. Adm. Code 302.105 (antidegradation standard) and was based on the information available to the Agency at the time the draft permit was written. We tentatively find that the proposed activity will result in the attainment of water quality standards; that all existing uses of the receiving stream will be maintained; that all technically and economically reasonable measures to avoid or minimize the extent of the proposed increase in pollutant loading have been incorporated into the proposed activity; and that this activity will benefit the community at large by providing treatment capacity for future growth. Comments received during the NPDES permit public notice period will be evaluated before a final decision is made by the Agency.

CC: Bob Mosher
Springfield Regional Office
Bill Ettinger
Chron



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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PAT QUINN, GOVERNOR

LISA BONNETT, INTERIM DIRECTOR

Memorandum

RECEIVED
OCT 27 2011

DATE: October 26, 2011

TO:

Gregg Sanders

Brent Fleming

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY
BOWWPC/PERMIT SECTION

FROM:

Bob Mosher

RM

SUBJECT: Springfield SD – Sugar Creek STP Water Quality Based Effluent Limit Evaluation
NPDES #IL0021971 (Sangamon County)

The subject facility discharges to Sugar Creek at a point where 1.5 cfs of flow exists upstream of the outfall during critical 7Q10 low-flow conditions. The DAF of this facility is 10.0 MGD and in 2010 the average of the three lowest effluent flow months was 8.07 MGD. Sugar Creek (segment EOA-06) is a General Use water. Sugar Creek is listed on the draft 2010 Illinois Integrated Water Quality Report and Section 303(d) List as an impaired water body for aquatic life uses. Potential causes of aquatic life use impairment are given as alterations in stream-side vegetative cover (non-pollutant), boron, and total phosphorus. Sugar Creek is not listed as a biologically significant stream in the 2008 Illinois Department of Natural Resources Publication *Integrating Multiple Taxa in a Biological Stream Rating System* at this locality, nor is it given an integrity rating in that report. Sugar Creek is not designated as an enhanced water at this location pursuant to the dissolved oxygen water quality standard.

Cadmium, Chromium (Trivalent), Copper, Lead, Nickel, and Zinc standards are based on hardness data collected at AWQMN Station E-26, Sangamon River at old Rt. 36 Bridge in Riverton with a critical hardness value of 260 mg/L as CaCO₃. Water quality standards identified in the table are expressed in units of mg/L. Dissolved metals standards have been converted to total metal except where noted. Samples were collected and analyzed by both the facility and Illinois EPA.

Substance	Max. Eff. Conc.	No. of Samples	Multiply by	95% Potential	Acute Standard	Chronic Standard	302.208(g) standard	Further Analysis?
Arsenic	<0.05	20	-	-	0.3600	0.1900	-	No RP*
Barium	0.08	63	1.1	0.088	-	-	5.0	No RP*
Cadmium	0.001	63	1.1	0.0011	0.0286	0.0024	-	No RP*
Chromium (Hex)	<0.01	20	-	-	0.0160	0.0110	-	No RP*
Chromium (Total)	<0.01	63	-	-	3.7979	0.4527	-	No RP*
Cyanide (WAD)	<0.01	20	-	-	0.0220	0.0052	-	No RP*
Copper	0.011	63	1.1	0.0121	0.0436	0.0268	-	No RP*
Fluoride	1.1	20	1.4	1.54	-	-	1.4	Yes
Iron (Dissolved)	0.1	20	1.4	0.14	-	-	1.0	No RP*
Lead	0.011	63	1.1	0.0121	0.3230	0.0677	-	No RP*
Manganese	0.07	63	1.1	0.077	8.70	3.70	-	No RP*

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CHAMPAIGN - 2125 S. FIRST ST., CHAMPAIGN, IL 61820 - (217) 278-5800

DES PLAINES - 9511 HARRISON ST., DES PLAINES, IL 60016 - (847) 294-4000

PEORIA - 5407 N. UNIVERSITY, ARBOR HALL #113, PEORIA, IL 61614 - (309) 693-5463

MARION - 2309 W. MAIN ST., SUITE 116, MARION, IL 62959 - (618) 993-7200

COLLINSVILLE - 2009 MALL STREET, COLLINSVILLE, IL 62234 - (618) 346-5120

Mercury (ng/L) **	2.7	16	1.5	4.1	-	-	12.0	No RP*
Nickel	0.016	63	1.1	0.0176	0.1852	0.0112	-	Yes
Phenols	0.012	20	1.4	0.0168	-	-	0.1	No RP*
Silver	0.0065	63	1.1	0.0072	-	-	0.005	Yes
Zinc	0.13	63	1.1	0.143	0.2745	0.0712	-	Yes
Selenium	0.005	63	1.1	0.0055	-	-	1.0	No RP*
Boron	0.448	43	1.1	0.4928	40.1	7.6	-	No RP*
Ethyl benzene	0.0027	5	2.3	0.0062	0.150	0.014	-	No RP*
Bis(2-ethylhexyl) phthalate	0.0124	5	2.3	0.0285	0.4	0.38	0.0019+	Yes

* No RP = no reasonable potential to exceed water quality standards.

** Mercury is reported in ng/L with the human health standard of 12 ng/L

*** Corrected chronic standard is given.

+ derived human health criterion

Other monitored parameters, such as organics, with no reported detections are not listed.

Further Analysis:

None of the 20 fluoride results exceeded the water quality standard. Since fluoride is a closely regulated additive to drinking water, no undue risk of exceeding the standard is present. No permit limits are necessary.

None of the 63 results exceeded the acute water quality standard for nickel. The average of the results is far lower than the chronic water quality standard. No permit limits are necessary.

One silver result out of 63 slightly exceeded the water quality standard. This value is likely an outlier. No permit limits are necessary.

None of the 63 results exceeded the acute water quality standard for zinc. The average of the results is far lower than the chronic water quality standard. No permit limits are necessary.

Bis(2-ethylhexyl) phthalate exceeded the human health water quality criterion in two samples. However, this substance is a common contaminant.

Recommendations:

Attached is a copy of the Ammonia Worksheet used to derive the appropriate water quality based effluent limits based on 35 IAC Part 355.

Daily maximum ammonia limits are based on acute water quality standards with no mixing. Limits are 6.9 mg/L for the spring/fall season, 6.9 mg/L summer and 8.4 mg/L winter.

Monthly average limits are based on the chronic water quality standards with no mixing. Limits are 1.5 mg/L for the spring/fall season, 1.4 mg/L summer and 4.0 mg/L winter.

Weekly average limits are based on the sub-chronic water quality standard with mixing. The limit for the spring/fall season is 3.8 mg/L and limit for the summer season is 3.5 mg/L. No value is recommended for the winter season because it would exceed the daily maximum limit.

My evaluation of the metals and other substances given in the table finds that no water quality standards based permit limits are necessary for any parameter. Water quality standards for these substances will be met at end-of-pipe. Bis(2-ethylhexyl) phthalate should have a monitoring condition to establish whether the measured results are truly effluent concentrations or come from contaminated sampling apparatus or laboratory equipment. One sample per month monitoring for the first six months after the effective date of the renewed permit should be required.

No whole effluent biomonitoring other than the routine four rounds of acute testing was recommended in an June 14, 2011 memo from Brian Koch. No acute toxicity was found in this effluent in recent tests.

These recommendations reflect a water quality standards perspective only and should not be construed as being inclusive of all factors which must be taken into consideration by the permit writer.

RGM:djp/springfieldsugar

Attachment

cc: FOS Region 5 Manager
Bill Ettinger

Ammonia Worksheet

Discharger: Springfield SD Sugar Creek STP NPDES: IL0021971 Date: 10/26/11
 Receiving Stream: Sugar Creek

Calculation of the total ammonia (as N) water quality standard

	pH and temperature values used in calculation			Total ammonia (as N) water quality standard		
	pH	temp		Chronic	Acute	
	50th %ile	75th %ile	75th %ile	(50th %ile)	(75th %ile)	(75th %ile)
Spring/Fall	7.90	8.10	20.1	2.0	1.5	6.9
Summer	7.90	8.10	25.8	1.4	1.0	6.9
Winter	7.70	8.00	6.9	5.8	4.0	8.4

Data Source: Springfield SD monitoring station in Sangamon River downstream of outfall for the dates January 2005 through January 2011

Note: Calculation of total ammonia (as N) water quality standards are based on the algorithms found at 35 IAC 302.212(b) and recommended water quality based limits for ammonia are derived pursuant to methodologies outlined at 35 IAC Part 355.
 Spring/Fall consists of March - May, September - October.
 Summer consists of June - August.
 Winter consists of November - February.

Chronic Wasteload Allocation

$$C_e = [C_{ds}(Q_{us} + Q_e) - C_{us}Q_{us}] / Q_e$$

Effluent Flow (Q _e):	12.5 cfs	2010 low 3 months average flow
Upstream 7Q10:	1.5 cfs	Source: ISWS 7Q10 map
7Q10 for dilution (Q _{us}):	0.75 cfs	
background concentrations:		
spring/fall	0.030 mg/L	Source: AWWQMN Station EOA-01, Sugar Creek at Rt. 29
summer	0.020 mg/L	for the dates Jan. 2006 to Oct. 2007.
winter	0.140 mg/L	
wasteload allocation:	spring/fall	2.1 mg/L (based on 50th percentile pH and mixing)
	summer	1.4 mg/L (based on 50th percentile pH and mixing)
	winter	6.2 mg/L (based on 50th percentile pH and mixing)

Note: Chronic wasteload allocations are calculated using a steady-state mass balance approach and procedures found at 35 IAC 355.203.

No ZID Available

Acute Wasteload Allocation

$$C_e = S(C_{ds} - C_{us}) + C_{us}$$

predicted stream width:	ft.	
diameter of outfall pipe (d):	ft.	wasteload allocation: spring/fall
maximum ZID radius (x):	0 ft.	summer
S = 0.3 (x/d) =		winter
		6.9 mg/L
		6.9 mg/L
		8.4 mg/L

Note: Acute wasteload allocations are determined using the jet-momentum equation found in USEPA's Technical Support Document for predicting near-field mixing characteristics. Outfall pipe diameters are based on Manning's equation and n=0.013.

WQBELs Recommended:	Daily Maximum:	spring/fall	6.9 mg/L	
		summer	6.9 mg/L	
		winter	8.4 mg/L	
	30-day Average:	spring/fall	1.5 mg/L	**
		summer	1.4 mg/L	
		winter	4.0 mg/L	**
	Weekly Average*:	spring/fall	3.8 mg/L	
		summer	3.5 mg/L	
		winter	N/A mg/L	***

* Note: Weekly average limits are based on the subchronic standard which is defined as 2.5 times the chronic limit at 35 IAC 302.212(b)(3) and Part 355.

**Note: Part 355 limits value to 1.5 and 4.0 mg/L

*** Value would exceed that of the daily maximum



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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PAT QUINN, GOVERNOR

JOHN J. KIM, INTERIM DIRECTOR

Memorandum

DATE: 12 June 2012

TO: Brant Fleming

FROM: Scott Twait *ST*

SUBJECT: WQBELs
Springfield Metro SD – Sugar Creek NPDES Permit No. IL0021971
(Sangamon County)

The subject facility discharges to Sugar Creek at a point where 1.5 cfs of flow exists upstream of the outfall during critical 7Q10 low-flow conditions. Sugar Creek (segment EOA-06) is a General Use water. Sugar Creek is not listed as a biologically significant stream in the 2008 Illinois Department of Natural Resources Publication *Integrating Multiple Taxa in a Biological Stream Rating System* at this locality, nor is it given an integrity rating in that report. Sugar Creek is not designated as an enhanced water at this location pursuant to the dissolved oxygen water quality standard.

The Springfield Metro SD – Sugar Creek facility discharges to Sugar Creek. Sugar Creek, Waterbody Segment, EOA-06, is listed on the draft 2010 Illinois Integrated Water Quality Report and Section 303(d) List as impaired for aquatic life use with potential causes given as alteration in stream-side or littoral vegetative cover (non-pollutant), boron, and phosphorus. From the treatment plant to the end of segment EOA-06 is a distance of 3.18 stream miles.

Sugar Creek flows to the Sangamon River (E-26). The draft 2010 303(d) List indicates that fish consumption use is impaired with potential cause given as polychlorinated biphenyls and primary contact use is impaired with potential cause given as fecal coliform. Aquatic life use is fully supported. Segment E-26 is 10.66 stream miles in length.

Segment E-04 is the next segment of the Sangamon River. The draft 2010 303(d) List indicates that fish consumption use is impaired with potential cause given as polychlorinated biphenyls. Aquatic life use is fully supported. Segment E-04 is 15.7 stream miles in length.

Segment E-24 is the next segment of the Sangamon River. The draft 2010 303(d) List indicates that fish consumption use is impaired with potential cause given as polychlorinated biphenyls and primary contact use is impaired with potential cause given as fecal coliform. Aquatic life use is fully supported. Segment E-24 is 22.99 stream miles in length.

Segment E-25 is the next segment of the Sangamon River. The draft 2010 303(d) List indicates that fish consumption use is impaired with potential cause given as polychlorinated biphenyls and primary contact use is impaired with potential cause given as fecal coliform. Aquatic life use is fully supported. Segment E-25 is 36.42 stream miles in length.

The Springfield Metro SD – Sugar Creek effluent travels a total of 88.95 miles before it joins the Illinois River. There is no algae impairment noted in the 303(d) List nor is there any impairment due to a cause of dissolved oxygen anywhere in this downstream continuum. There is no evidence to imply that phosphorus from the Springfield Metro SD – Sugar Creek facility is causing any impairment prohibited by the narrative water quality standard.

Expanded Facility

Since this is a major facility that is expanding, a NPDES permit limit of 1.0 mg/L for phosphorus is appropriate as per 35 IAC 304.123(g).

Attached is a copy of the Ammonia Worksheet used to derive the appropriate water quality based effluent limits based on 35 IAC Part 355.

Given the predicted ambient conditions of Sugar Creek near the outfall, as determined using site-specific monitoring in Sangamon River downstream of outfall, monthly average limits of 1.5 mg/L (spring/fall), 1.4 mg/L (summer), and 4.0 mg/L (winter) are appropriate. The spring/fall, and winter limits are based on 75th percentile pH and allowed mixing and the summer limit is based on median pH and allowed mixing.

Daily maximum limits of 6.9 mg/L (spring/fall), 6.9 mg/L (summer), and 8.4 mg/L (winter) are recommended. These limits reflect the seasonal acute water quality standards with no mixing allowance since the stream has insufficient stream width for discharge induced mixing.

If applicable, weekly average limits of 3.8 mg/L (spring/fall) and 3.5 mg/L (summer) are appropriate. These values are based on 2.5 times the chronic limit. No weekly average limit for winter is recommended because the value would be higher than the daily maximum permit limit.

These recommendations reflect a water quality standards perspective only and should not be construed as being inclusive of all factors that must be taken into consideration by the permit writer.

Attachment

cc: Bob Mosher
Springfield Regional Office
Bill Ettinger
Chron

Ammonia Worksheet

Discharger: Springfield Metro SD - Sugar Creek NPDES: IL0021971 Date: 6/12/12
 Receiving Stream: Sugar Creek

Calculation of the total ammonia (as N) water quality standard

	pH and temperature values used in calculation			Total ammonia (as N) water quality standard		
	pH	temp		Chronic	Acute	
	50th %ile	75th %ile	75th %ile	(50th %ile)	(75th %ile)	(75th %ile)
Spring/Fall	7.90	8.10	20.1	2.0	1.5	6.9
Summer	7.90	8.10	25.8	1.4	1.0	6.9
Winter	7.70	8.00	6.9	5.8	4.0	8.4

Data Source: Site-specific monitoring station in Sangamon River downstream of outfall, for the dates Jan. 2005 to Jan. 2011.

Note: Calculation of total ammonia (as N) water quality standards are based on the algorithms found at 35 IAC 302.212(b) and recommended water quality based limits for ammonia are derived pursuant to methodologies outlined at 35 IAC Part 355.
 Spring/Fall consists of March - May, September - October.
 Summer consists of June - August.
 Winter consists of November - February.

Chronic Wasteload Allocation

$C_e = [C_{ds}(Q_{us} + Q_e) - C_{us}Q_{us}] / Q_e$

Effluent Flow (Q _e):	23.2 cfs	DAF (15.0 MGD)
Upstream 7Q10:	1.5 cfs	Source: ISWS map of the Sangamon Region.
7Q10 for dilution (Q _{us}):	0.75 cfs	
background concentrations:		
spring/fall	0.030 mg/L	Source: AWQMN station EOA-01, Sugar Creek, at Rt. 29, for the dates Jan. 2006 to Oct. 2007.
summer	0.020 mg/L	
winter	0.140 mg/L	
wasteload allocation:	spring/fall	1.5 mg/L (based on 75th percentile pH and mixing)
	summer	1.4 mg/L (based on median pH and mixing)
	winter	4.1 mg/L (based on 75th percentile pH and mixing)

Note: Chronic wasteload allocations are calculated using a steady-state mass balance approach and procedures found at 35 IAC 355.203.

Acute Wasteload Allocation

$C_e = S(C_{ds} - C_{us}) + C_{us}$

(Note: Insufficient stream width for discharge induced mixing.)

predicted stream width:	ft.	
diameter of outfall pipe (d):	ft.	wasteload allocation: spring/fall 6.9 mg/L
maximum ZID radius (x):	0 ft.	summer 6.9 mg/L
S = 0.3 (x/d) =		winter 8.4 mg/L

Note: Acute wasteload allocations are determined using the jet-momentum equation found in USEPA's Technical Support Document for predicting near-field mixing characteristics. Outfall pipe diameters are based on Manning's equation and n=0.013.

WQBELs Recommended:	Daily Maximum:	spring/fall	6.9 mg/L
		summer	6.9 mg/L
		winter	8.4 mg/L
	30-day Average:	spring/fall	1.5 mg/L
		summer	1.4 mg/L
		winter	4.0 mg/L**
	Weekly Average*:	spring/fall	3.8 mg/L
		summer	3.5 mg/L
		winter	N/A mg/L

* Note: Weekly average limits are based on the subchronic standard which is defined as 2.5 times the chronic limit at 35 IAC 302.212(b)(3) and Part 355.

** Note: Agency policy does not grant allowed mixing in excess of 1.5/1.5/4.0 mg/L for the spring/fall, summer, and winter seasons respectively for nitrifying facilities. The spring/fall and winter limits were based on 75th percentile pH and allowed mixing and the summer limit is based on median pH and allowed mixing and limited to 4.0 mg/L because median pH was used.